

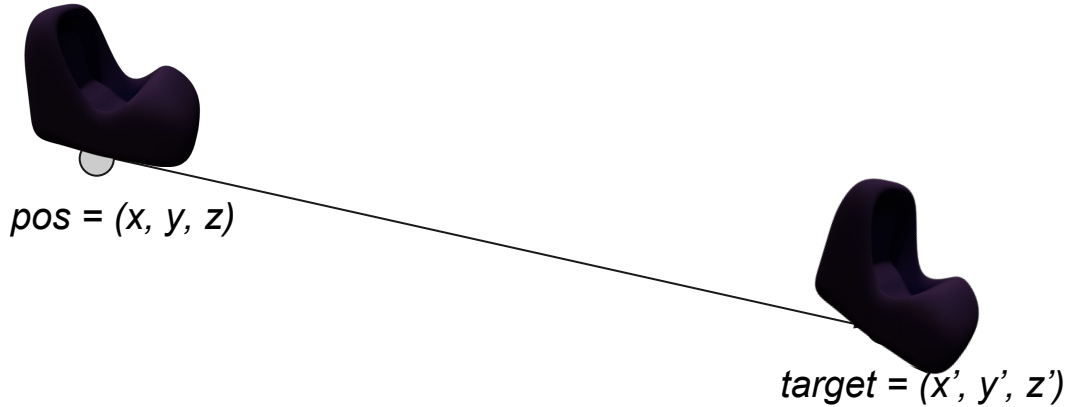
# CSE 167



# Discussion #8

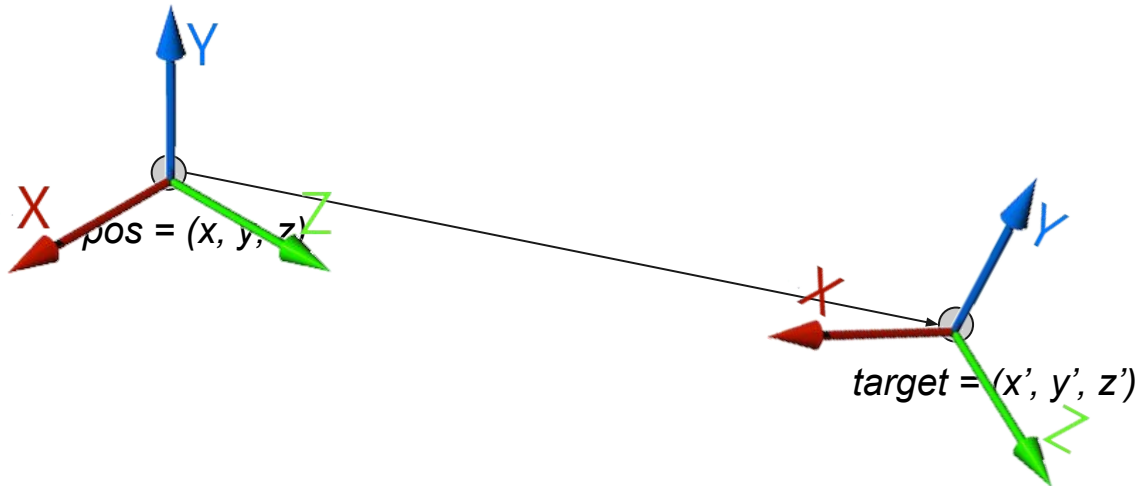
I'm the only human who can do it

# Coaster Orientation



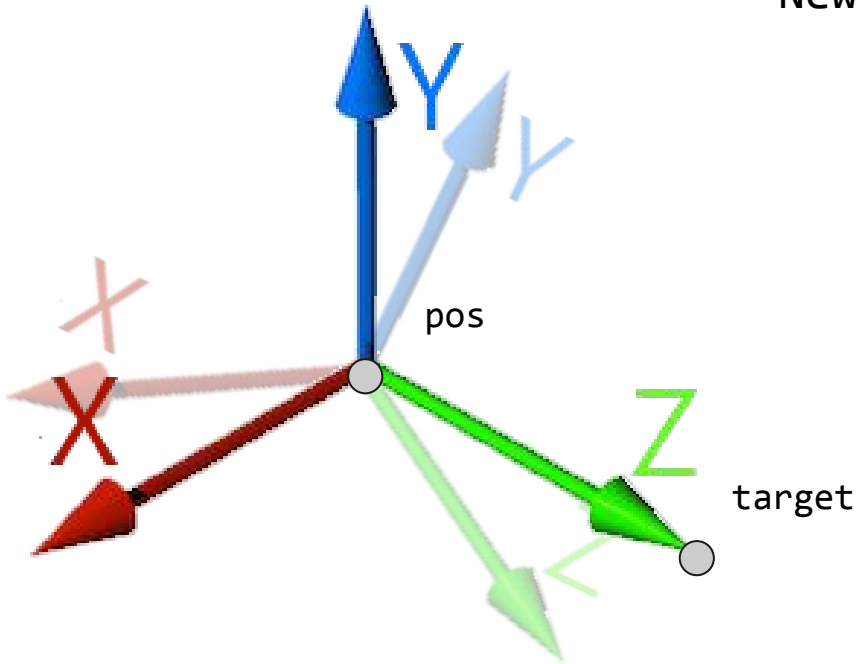
# Coaster Orientation

Rotation &  
Translation

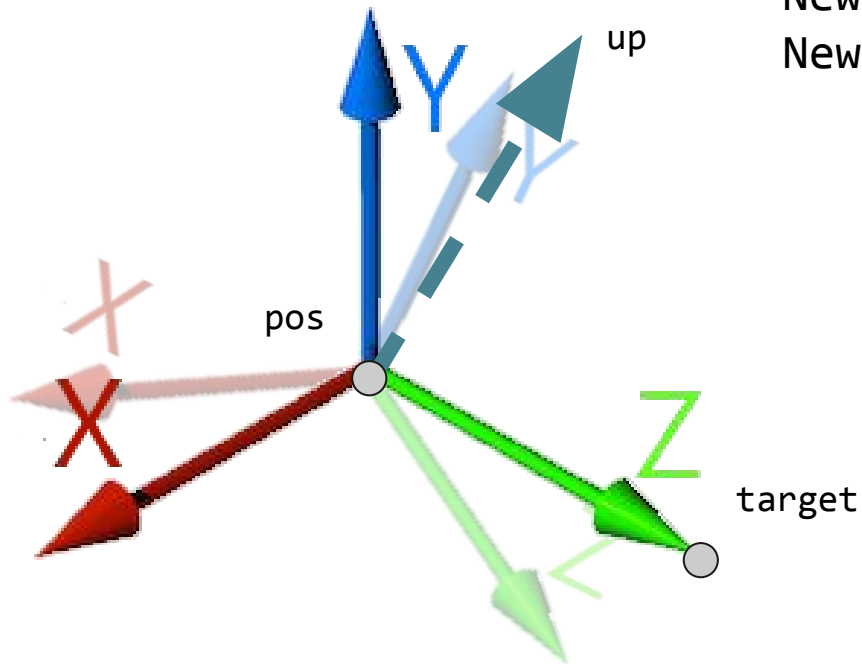


# Coaster Rotation

New Z = normalize(target - pos)

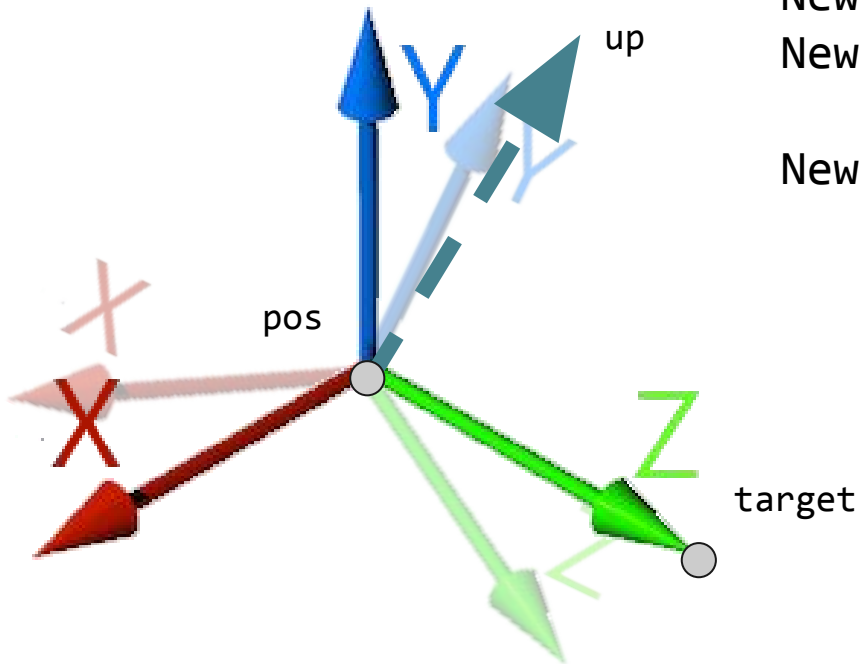


# Coaster Rotation



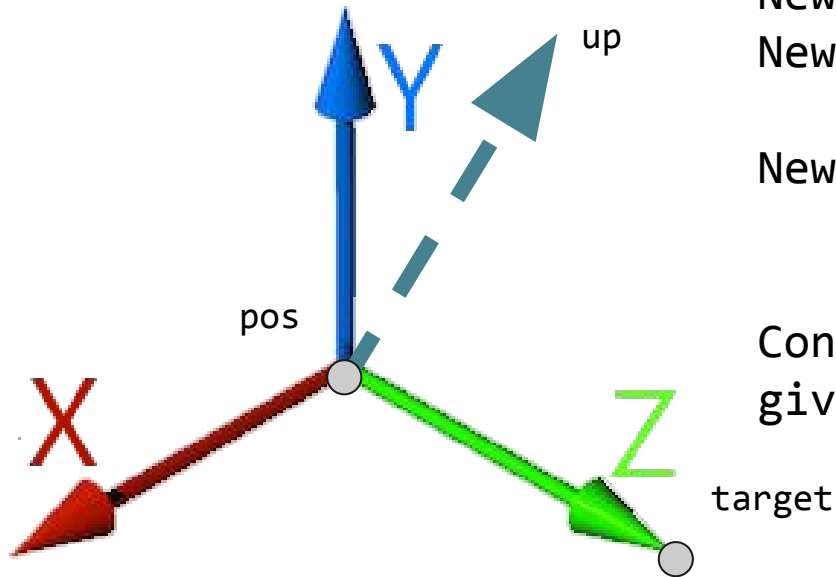
```
New Z = normalize(target - pos)
New X = normalize(cross(<0, 1, 0>,
                       New Z))
```

# Coaster Rotation



```
New Z = normalize(target - pos)
New X = normalize(cross(<0, 1, 0>,
                       New Z))
New Y = normalize(cross(New X,
                       New Z))
```

# Coaster Rotation



```
New Z = normalize(target - pos)
New X = normalize(cross(<0, 1, 0>,
                       New Z))
New Y = normalize(cross(New X,
                       New Z))
```

Construct the transformation matrix,  
given New (X, Y, Z) and pos

# Moving Points

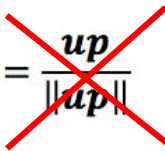
z-axis

$$z_c = \frac{e - d}{\|e - d\|}$$

x-axis

$$x_c = \frac{up \times z_c}{\|up \times z_c\|}$$

y-axis

$$y_c = z_c \times x_c = \frac{up}{\|up\|}$$


$$C = \begin{bmatrix} x_c & y_c & z_c & e \\ 0 & 0 & 0 & 1 \end{bmatrix}$$



# Moving Points

- If we take our control point's position and add the camera's scaled x-axis and scaled y-axis, we can move the control point in the camera's x-y plane
  - $\text{control\_pos} = \text{control\_pos} + s_{\text{x-axis}} * \text{x-axis} + s_{\text{y-axis}} * \text{y-axis}$